

CLAIMS

1. A method of treating a volume of plastics waste, including:
  - 5 providing a volume of plastics waste comprising one or more plastics types, the or each of the plastics types having a melting point and a flash point;
  - 10 providing a heating zone having an entry zone through which the volume of plastics waste is feedable and an outlet downstream of the entry zone relative to the direction of flow of plastics waste;
  - 15 bringing the heating zone to a predetermined operating temperature, the operating temperature being selected so as to be less than the flash point of the one or more plastics types to avoid causing carbonisation of the plastics waste;
  - 20 heating the volume of plastics waste in the heating zone to a temperature at which at least some of the volume of plastics waste is melted to form a flowable plastics melt including molten and non-molten plastics waste wherein the molten plastics waste encapsulates and supports the non-molten plastics waste and sterilises any contaminants included therein;
  - 25 causing the flowable plastics melt to flow from the heating zone to the outlet under the influence of gravity.
2. A method of treating a volume of plastics waste, including:
  - 30 providing a volume of plastics waste comprising one or more plastics types, the or each of the plastics types having a melting point and a flash point;

providing a heating zone having an entry zone through which the volume of plastics waste is feedable and an outlet downstream of the entry zone relative to the direction of flow of plastics waste;

5 bringing the heating zone to a predetermined operating temperature, the operating temperature being selected so as to be less than the flash point of the one or more plastics types to avoid causing carbonisation of plastics waste;

10 allowing the volume of plastics waste to fall from the entry zone into the heating zone under the influence of gravity;

heating the volume of plastics waste in the heating zone to a temperature at which at least some of the volume of plastics waste is melted to form a flowable plastics melt;

15 causing the flowable plastics melt to flow through the outlet under the influence of gravity and into a cooling zone during which gas is allowed to escape to facilitate the flow;

20 causing the flowable plastics melt in the cooling zone to solidify.

3. A method of treating a volume of plastics waste, including:

25 providing a volume of plastics waste comprising one or more plastics types, the or each of the plastics types having a melting point and a flash point;

providing a heating zone having an entry zone into which the volume of plastics waste is feedable and an outlet downstream of the inlet relative to the direction of flow of plastics waste;

30 bringing the heating zone to a predetermined operating temperature, the operating temperature being selected so as to be less than the flash point of the

one or more plastics types to avoid causing carbonisation of plastics waste;

allowing the volume of plastics waste to fall from the entry zone into the heating zone under the influence of gravity;

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creating a non-uniform thermal surface in the region where the entry zone leads into the heating zone to facilitate the flow of plastics waste from the entry zone into the heating zone;

10 heating the plastics waste in the heating zone to a temperature at which at least some of the volume of plastics waste is melted to form a flowable plastics melt;

causing the flowable plastics melt to flow from the heating zone to the outlet under the influence of gravity.

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4. A method as claimed in claim 1 or claim 2, further including creating a non-uniform thermal surface in the region where the entry zone leads into the heating zone to facilitate the flow of plastics waste from the entry zone into the heating zone.

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5. A method as claimed in claim 3 or claim 4, wherein the non-uniform thermal surface is created by providing a plurality of heating members which extend transversely to the flow of plastics waste and which have tapered leading edges terminating at different heights in the region where the entry zone leads 25 into the heating zone.

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6. A method as claimed in any one of claims 1, 3, 4 and 5, further including allowing the flowable plastics melt to flow into a cooling zone during which gas is allowed to escape to facilitate the flow of the plastics melt and causing the flowable plastics melt to solidify.

7. A method as claimed in claim 2 or claim 6, wherein the flowable plastics

- 57 -

melt is formed into sterile, shaped and stackable solidified bodies of plastics waste in the cooling zone.

8. A method as claimed in any one of claims 1 to 7, further including  
5 fragmenting the plastics waste prior to the plastics waste entering the heating zone.

9. A method as claimed in claim 8, wherein fragmenting the plastics waste occurs within the entry zone.

10. A method as claimed in claim 8 or claim 9, wherein fragmenting the plastics waste is carried out by a shredding action.

11. A method as claimed in any one of claims 1 to 10, further including  
15 filtering fumes released when the plastics waste is heated and filtering air outside the entry zone, heating zone and cooling zone by utilising atmospheric pressure non-equilibrium plasma technology.

12. An apparatus for treating a volume of plastics waste, the apparatus  
20 including:

a melt chamber having an inlet and an outlet downstream of the inlet, the melt chamber defining a heating zone for receiving and heating a volume of plastics waste;

25 heating means for bringing the temperature of the melt chamber to a pre-determined level and for heating the volume of plastics waste to a temperature at which at least some of the volume of plastics waste is melted to form a flowable plastics melt;

30 cooling chamber means disposed downstream of the melt chamber outlet and defining a cooling zone for receiving and cooling the flowable plastics melt; and

means defining a vent for permitting gas to escape from the melt chamber during the flow of the flowable plastics melt from the heating zone into the cooling zone.

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13. An apparatus as claimed in claim 12, wherein the vent is constituted by a gap disposed between the melt chamber and the cooling chamber means.

14. An apparatus as claimed in claim 13, wherein the gap has a width in the 10 range of 0.4 to 2.5 mm.

15. An apparatus for treating a volume of plastics waste, the apparatus including:

15 a melt chamber having an inlet and an outlet downstream of the inlet, the melt chamber defining a heating zone for receiving and heating a volume of plastics waste;

20 heating means for bringing the temperature of the melt chamber to a pre-determined level and for heating the volume of plastics waste to a temperature at which at least some of the volume of plastics waste is melted to form a flowable plastics melt;

25 wherein the heating means includes a plurality of heating members which extend transversely to the flow of plastics waste and which are arranged to create a non-uniform thermal surface in the region of the melt chamber inlet.

30 16. An apparatus as claimed in claim 15, wherein the heating members are constituted by fins having a leading edge near the inlet of the melt chamber and a trailing edge near the outlet of the melt chamber.

17. An apparatus as claimed in claim 16, wherein the leading edges of

- 59 -

alternate heating members terminate at different upstream locations relative to the leading edges of adjacent heating members to provide a non-uniform thermal surface.

5 18. An apparatus as claimed in one of claims 15 to 17, wherein the melt chamber has oppositely facing side walls and wherein the heating members extend between and are removably supported by the side walls.

10 19. An apparatus as claimed in any one of claims 15 to 18, wherein the heating members have at least one electrical resistive heating element embedded therein.

15 20. An apparatus as claimed in any one of claims 15 to 19, further including cooling chamber means disposed downstream of the melt chamber outlet and defining a cooling zone for receiving and cooling the flowable plastics melt.

21. An apparatus as claimed in claim 12 or claim 20, the cooling chamber means being defined by at least one mould cavity for forming a solidified body of plastics waste.

20 22. An apparatus as claimed in claim 21, wherein the or each mould cavity is of discoidal form having dimensions selected to enable a drinks can to be encapsulated by the solidified body of plastics waste in the mould cavity.

25 23. An apparatus as claimed in any one of claims 12 to 23, further including means for fragmenting the plastics waste prior to the plastics waste entering the melt chamber.

30 24. An apparatus as claimed in claim 23, wherein the fragmenting means is disposed upstream of the melt chamber inlet.

25. A method of treating a volume of plastics waste according to any one of

claims 1 to 3 and as substantially as hereinbefore described.

26. A method of treating a volume of plastics waste substantially as hereinbefore described and with reference to Figure 22a of the accompanying drawings.

27. A method of treating a volume of plastics waste substantially as hereinbefore described and with reference to Figures 22b, 24a, 24b, 25a, 25b and 26 of the accompanying drawings.

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28. A method of treating a volume of plastics waste substantially as hereinbefore described and with reference to Figure 23 of the accompanying drawings.

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29. A method of treating a volume of plastics waste substantially as hereinbefore described and with reference to or as illustrated in Figure 28 of the accompanying drawings.

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30. An apparatus for treating a volume of plastics waste substantially as hereinbefore described with reference to or as illustrated in Figures 1 to 14 and as modified by Figure 22a of the accompanying drawings.

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31. An apparatus for treating a volume of plastics waste substantially as hereinbefore described with reference to or as illustrated in Figures 1 to 14 and as modified by Figures 22b, 24a, 24b, 25a and 25b of the accompanying drawings.

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32. An apparatus for treating a volume of plastics waste substantially as hereinbefore described with reference to or as illustrated in Figures 1 to 14 and as modified by Figures 22b, 24a, 24b, 25a, 25b and 26 of the accompanying drawings.

- 61 -

33. An apparatus for treating a volume of plastics waste substantially as hereinbefore described with reference to or as illustrated in Figures 1 to 14 and as modified by Figure 23 of the accompanying drawings.

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34. An apparatus for treating a volume of plastics waste substantially as hereinbefore described with reference to or as illustrated in Figures 1 to 14 and as modified by Figure 28 of the accompanying drawings.

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